LISTING OF CLAIMS

1. (Previously Presented) A method of analysis of an array image including one or more luminous spots on a background, comprising:

determining a shape and location of each spot on the array image;

generating a binary map of pixels defining a boundary of each spot on the background;

isolating each spot from the background by an extraction operation using said binary map;

examining each spot by a segmentation operation to identify pixels belonging to a same cluster according to a preestablished criterion; and

for each spot, defining relative characteristic parameters and quality indexes determined in function of gray levels of pixels of the spot;

wherein said binary map is generated with a technique of morphological filtering comprising:

filtering the array image with at least a morphological filter generating only a single corresponding marker image of the background;

determining a background level by carrying out a reconstruction operation on said single corresponding marker image to generate a corresponding reconstructed image of the background; and

generating a filtered image from which the luminosity of the background is removed by performing a top-hat operation on said reconstructed background image and the array image; and performing a thresholding operation on said filtered image of the background luminosity.

2. (Original) The method of claim 1, wherein said reconstruction operation is carried out using circular masks.

3. (Previously Presented) The method of claim 2, further comprising filtering the noise corrupting said binary map by:

carrying out in succession two erosion operations using circular masks of different ratios;

carrying out a dilation operation using a circular mask of diameter larger than the maximum dimensions of the spot,

generating a binary map filtered from noise; and

using said binary map filtered from noise in said extraction operation.

4. (Previously Presented) The method of claim 1, wherein said marker image is generated by:

defining on a Cartesian reference frame spots present in the array image;

carrying out in succession the following morphological filtering operations of said spots with directional openings having as structuring sets segments of length not larger than the maximum dimension of the spots and oriented, respectively, along:

the bisecting line of the first and third quadrant;

the bisecting line of the second and fourth quadrant;

the abscissa axis; and

the ordinate axis;

of said Cartesian reference frame.

5. (Previously Presented) The method according to claim 1, wherein said extraction operation comprises:

scanning pixels of an image by column or by row, associating to adjacent pixels scanned in succession and corresponding to pixels of the relative binary map having the same logic active value a quadruplet defining an elementary cluster composed of an identification number, minimum and maximum coordinates and number of column or of row;

identifying for each elementary cluster in a certain column or row a set of elementary clusters in the column or row immediately preceding bordering said elementary cluster;

identifying in said set of elementary cluster a winner cluster having the largest number of boundary pixels with said elementary cluster and the remaining clusters as losers, and making the identification number of said elementary cluster equal to the identification number of said winner cluster;

making the identification number of each of the loser clusters equal to the identification number of the respective winner cluster; and

selecting pixels of luminous spots by extracting from the original image pixels of clusters having the same identification number.

6. (Previously Presented) The method of claim 1, wherein said preestablished criterion of segmentation comprises calculating a characteristic value for pixels of a spot by a fuzzy logic algorithm in order to discriminate pixels belonging to foreground and to background, wherein calculating comprises:

calculating for said spot the mean value of grey level of the background pixels, said fuzzy logic algorithm using as antecedents:

the grey level of a pixel;

the distance between said grey level of the pixels and the mean grey level of the background pixels; and

the square of said distance; and

recognizing said pixels as belonging to a same cluster if said characteristic value exceeds a preestablished threshold.

7. (Previously Presented) The method of claim 6, further comprising: defining by said preset criterion for each spot a first zone containing signal pixels and a second zone containing background and/or noise pixels.

8. (Previously Presented) The method of claim 6, wherein each antecedent has three distributed membership functions.

9. (Previously Presented) The method of claim 8, wherein said membership functions are Gaussian distributed membership functions having preset mean and variance.

10. (Original) The method of claim 6, wherein said fuzzy logic algorithm has five consequents.

11. (Previously Presented) The method of claim 6, wherein said segmentation operation comprises:

scanning pixels of an image by column or by row, associating to adjacent pixels scanned in succession and corresponding to pixels of the relative binary map having the same logic active value a quadruplet defining an elementary cluster composed of an identification number, minimum and maximum coordinates and number of column or of row;

identifying for each elementary cluster in a certain column or row a set of elementary clusters in the column or row immediately preceding bordering said elementary cluster;

identifying in said set of elementary cluster a winner cluster having the largest number of boundary pixels with said elementary cluster and the remaining clusters as losers, and making the identification number of said elementary cluster equal to the identification number of said winner cluster;

making the identification number of each of the loser clusters equal to the identification number of the respective winner cluster; and

selecting pixels of luminous spots by extracting from the original image pixels of clusters having the same identification number.

12. (Previously Presented) The method of claim 7 comprising calculating for each spot characteristic parameters and quality indexes belonging to the group consisting of

the mean value of the grey levels of the pixels of said first zone;

the coordinates of the center of gravity of the spot;

the mean value of the grey levels of the border pixels of the spot;

the median of the grey levels of said first zone;

the median of the grey levels of said border pixels of the spot;

the ratio between height and width of the smallest rectangle containing said first zone;

the number of pixels composing the spot;

the number of border pixels of the spot;

the number of pixels of said first zone;

a normalization factor of the grey levels of the pixels equal to the difference between the median of the grey levels of the pixels of said first zone and the median of the grey levels of the border pixels of the spot; and

the mean value of said characteristic value for the pixels of said first zone.

13. (Previously Presented) A device for the analysis of array images comprising an array localization system having the architecture of a cellular neural network for processing the pixels of luminous spots and implementing the following operations:

determining a shape and location of each spot on the array image;

generating a binary map of pixels defining a boundary of each spot on the dark background;

isolating each spot from the background by an extraction operation using said binary map;

examining each spot by a segmentation operation to identify pixels belonging to a same cluster according to a preestablished criterion; and

for each spot, defining relative characteristic parameters and quality indexes;

wherein said binary map is generated with a technique of morphological filtering comprising:

i) filtering the array image with at least a morphological filter generating only a single corresponding marker image of the background;

ii) determining a background level by carrying out a reconstruction operation on said single corresponding marker image to generate a corresponding reconstructed image of the background;

iii) generating a filtered image from which the luminosity of the background is removed by performing a top-hat operation on said reconstructed background image and the array image; and

iv) performing a thresholding operation on said filtered image of the background luminosity.

14. (Previously Presented) The device of claim 13, having a spot extraction system for isolating luminous spots on a background of an array image, comprising:

a scanning subsystem of the pixels of an image;

a subsystem of identification of elementary clusters composed of adjacent pixels scanned in succession implementing the spot extraction operation; and

a subsystem of processing of said elementary clusters outputting clusters of pixels present in the spot.

15. (Previously Presented) The device of claim 14, having an intra-spot segmentation system of luminous spots on a background of an image, comprising:

a scanning subsystem of pixels of a spot; and

a fuzzy logic processing subsystem coupled to said scanning subsystem, the subsystem discriminating the scanned pixels in foreground signal pixels and background or noise pixels using fuzzy logic processing using Gaussian distributed membership functions.

16. (Previously Presented) The device of claim 15, wherein said fuzzy logic processing subsystem implements an intra-spot segmentation operation and comprises:

a subsystem defining elementary clusters composed of adjacent pixels, and further comprising a processing subsystem of said elementary cluster that outputs clusters of pixels found in said spot.

Claims 17-20. (Canceled).

21. (Currently Amended) A method of segmentation of luminous spots on a background of an array image for identifying pixels of objects represented in a spot from background or noise pixels, comprising:

scanning the pixels;

executing a fuzzy logic algorithm in order to discriminate pixels as belonging to foreground and to background, the fuzzy logic algorithm comprising:

calculating a characteristic value for each scanned pixel, wherein the fuzzy logic algorithm uses as antecedents:

the grey level of the pixel,

the distance between said grey level of the pixel and the mean grey level of background pixels, and

the square of said distance;

calculating the mean value of grey level of the background pixels; and

defining a pixel as belonging to the spot if said characteristic value exceeds a preestablished threshold;

wherein said segmentation operation comprises defining by said preset criterion for each spot a first zone containing signal pixels and a second zone containing background and/or noise pixels; and

calculating for each spot characteristic parameters and quality indexes belonging to the group consisting of:

the mean value of the grey levels of the pixels of said first zone;

the coordinates of the center of gravity of the spot;

the mean value of the grey levels of the border pixels of the spot;

the median of the grey levels of said first zone;

the median of the grey levels of said border pixels of the spot;

the ratio between height and width of the smallest rectangle containing said first zone;

the number of pixels composing the spot;

the number of border pixels of the spot;

the number of pixels of said first zone;

a normalization factor of the grey levels of the pixels equal to the difference between the median of the grey levels of the pixels of said first zone and the median of the grey levels of the border pixels of the spot; and

the mean value of said characteristic value for the pixels of said first zone.

22. (Previously Presented) The method of claim 21, comprising:

scanning pixels of an image by column or by row, associating to adjacent pixels scanned in succession and corresponding to pixels of the relative binary map having the same logic active value a quadruplet defining an elementary cluster composed of an identification number, minimum and maximum coordinates and number of column or of row;

identifying for each elementary cluster in a certain column or row a set of elementary clusters in the column or row immediately preceding bordering said elementary cluster;

identifying in said set of elementary cluster a winner cluster having the largest number of boundary pixels with said elementary cluster and the remaining clusters as losers, and making the identification number of said elementary cluster equal to the identification number of said winner cluster;

making the identification number of each of the loser clusters equal to the identification number of the respective winner cluster; and

selecting pixels of luminous spots by extracting from the original image pixels of clusters having the same identification number.

Claims 23-28. (Canceled).